

CMSC 471
Artificial Intelligence
Spring 2021

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Instructor: Frank Ferraro

ITE 358/Remote

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Monday: 2:15-3

Thursday: 12-1

by appointment

Natural language processing

Semantics

Vision & language processing

Learning with low-to-no supervision

TAs

(MW 1-2:15)

Zeenat Ali

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Office hours: see
discussion board, and by
appointment

(MW 4-5:15)

Kinjal Patel

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Office hours: see
discussion board, and by
appointment

Administrivia

The Book & This Class

artint.info/2e/index.html

ARTIFICIAL INTELLIGENCE 2E

FOUNDATIONS OF COMPUTATIONAL AGENTS



[Home](#)

[Complete Book](#)

[Resources](#)

[Slides](#)

Full text of second edition now available

The full text is now freely available with stable links.

You can buy a copy (and instructors can request an examination copy) from [Cambridge University Press](#) or your local bookstore or [Amazon](#).

Authors

[David Poole](#)
[Alan Mackworth](#)

Web Presence

WWW

Schedule, slides, assignments,
readings, materials, syllabus here

https://csee.umbc.edu/courses/undergraduate/471/spring21/01_03/



<http://piazza.com/umbc/spring2021/cm471/home>

piazza

Course announcements,
Q&A, discussion board here

Please Read the Syllabus (On the Website)

https://csee.umbc.edu/courses/undergraduate/471/spring21/01_03/materials/syllabus.pdf



CMSC 471 — Introduction to Artificial Intelligence
Sections 01 and 03
Spring 2021 (3 credits)
Version 1.0 — January 27th, 2021

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Academic Integrity

Super important: I take it **very** seriously

You are responsible for your (& your group's) own work: if in doubt, ask!

Penalties could include 0 on the assignment, course failure, suspension, or expulsion (not exhaustive)

Grading

Component	471
Assignments	45%
Exams (Midterm + Final)	40%
Course Engagement	15%

Computation of Component Grades

Each component (e.g.,
“Assignment” component) is:
 $\max(\text{micro-average}, \text{macro-average})$

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65/90

95/100

95/110

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Assignment grades
(not representative)

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Assignment grades
(not representative)

$$\text{microaverage} = \frac{65 + 95 + 95 + 100}{90 + 100 + 110 + 110} \approx 86.59\%$$

$$\text{macroaverage} = \frac{1}{4} \left(\frac{65}{90} + \frac{95}{100} + \frac{95}{110} + \frac{100}{110} \right) \approx 86.12\%$$

We'll learn what these
are in the semester

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95/100
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Final Grades

471

\geq	Letter
90	A
80	B
70	C
65	D
0	F

Running the Assignments

A "standard" x86-64 Linux machine, like `g1` or the platform Google Colab `g1`

A passable amount of memory (2GB-4GB) [this is definitely the upper range]

Modern but not necessarily cutting edge software

If in doubt, ask first

Programming Languages for Assignments

Python, though individual assignments could vary

Remember: programming languages are *tools*. Don't get too caught up in not "knowing" a language. This course will not be grading software engineering prowess.

Libraries: Assignment dependent. Generally OK, as long as you don't use their implementation of what you need to implement

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Everyone has a budget of 10 *late days*

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If you don't have any left: still turn assignments in. They could count in your favor in borderline cases

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Everyone has a budget of 10 *late days*

Use them as needed throughout the course

They're meant for personal reasons and emergencies

Do not procrastinate

Late Policy

Everyone has a budget of 10 *late days*

Contact me privately if an extended absence will occur

You must know how many you've used



YEAH. IT'S HILARIOUS, BUT IT'S JUST CLUMSILY SAMPLING A HUGE DATABASE OF LINES PEOPLE HAVE TYPED. CHATTERBOTS STILL HAVE A LONG WAY TO GO.



PRETTY MUCH.



Q: What is AI
(artificial intelligence)?



Artificial Intelligence

News about Artificial Intelligence, including comments from the New York Times.

Latest

Search

You've probably read about it!

Aug. 26, 2018

Artificial Intelligence Is Now a Pentagon Priority. Will Silicon Valley Help?

The Defense Department, believing that A.I. research should be a national priority, has called on the White House to “inspire a whole of country effort.”

By CADE METZ



August 2018

Aug. 17, 2018

Alexa vs. Siri vs. Google: Which Can Carry on a Conversation Best?

Digital assistants from Amazon, Apple and Google can only have meager back-and-forth exchanges with us. Listen to how that tells us something about where they're going in the future.

By KEITH COLLINS and CADE METZ



Aug. 16, 2018

Google Employees Protest Secret Work on Censored Search Engine for China

About 1,400 of the internet company's employees have signed a letter demanding transparency, saying censored search results raise “urgent moral and ethical issues.”

By KATE CONGER and DAISUKE WAKABAYASHI



Dec. 15, 2020

COMENTARIO

Debemos darle un toque humano a la economía de la inteligencia artificial

Adoptar la inteligencia artificial puede ayudarnos a crear un nuevo contrato social equitativo, pero solo si recordamos algo indispensable: qué es lo que nos hace humanos.

By KAI-FU LEE

[Read in English](#)



Dec. 14, 2020

THE STONE

A.I. and I

Artificial intelligence has given my pancreas a mind of its own. Am I the human being of the future?

By MARK C. TAYLOR



January 2021

Dec. 10, 2020

TURNING POINTS

Give the A.I. Economy a Human Touch

Embracing artificial intelligence can help us create a new, equitable social contract — but only if we remember what makes us human.

By KAI-FU LEE



Dec. 10, 2020

WHEELS

Smarter Traffic Lights, Calmer Commuters

Advances in technology may come to a corner near you, easing traffic and possibly helping the environment.

By PAUL STENQUIST



What is AI?

Q. What is artificial intelligence?

A. It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

<http://www-formal.stanford.edu/jmc/whatisai/>

Ok, so what is intelligence?

Q. Yes, but what is intelligence?

A. Intelligence is the computational part of the ability to **achieve goals** in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines

<http://www-formal.stanford.edu/jmc/whatisai/>

Every AI must mention
the 1956 Dartmouth
Conference...

1956 Dartmouth AI Project

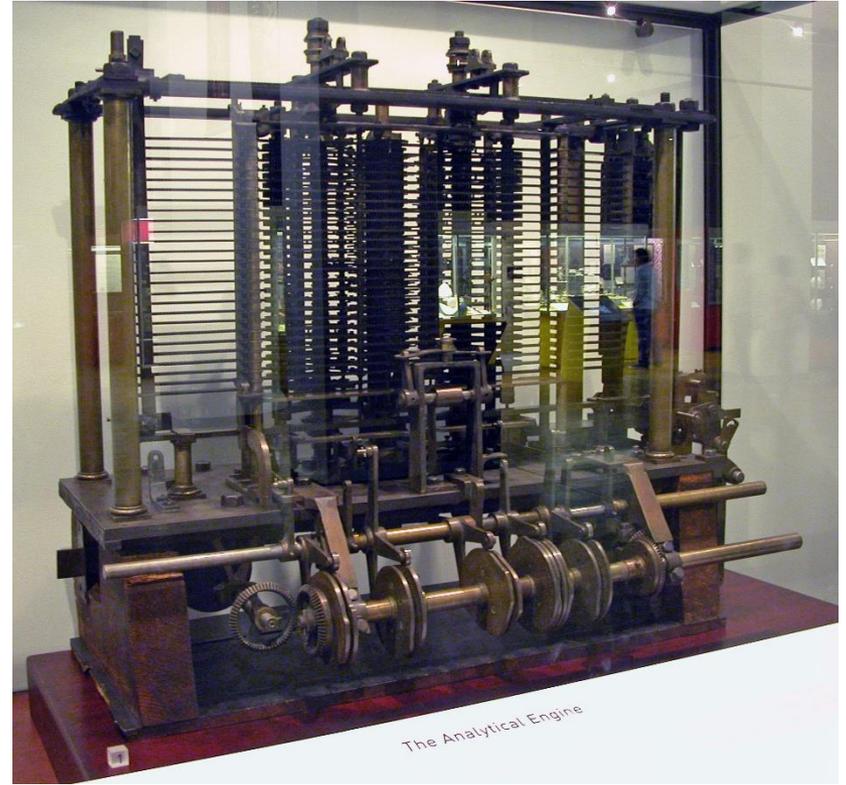
“We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.”

<http://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html>

... but don't think AI
started there...



[Ada Lovelace Day Honors "the First Computer Programmer" - Scientific American Blog Network](#)



[Analytical Engine - Wikipedia](#)

... nor that it ended there.

What can't AI systems do yet? (Fully? Completely?)

- Understand natural language robustly (e.g., read and understand articles in a newspaper)
- Surf the web and find interesting knowledge
- Interpret an arbitrary visual scene
- Learn a natural language
- ~~Play Go well~~
- Construct plans in dynamic real-time domains
- Refocus attention in complex environments
- Perform life-long learning

**Exhibit true autonomy
and intelligence!**

Big questions

- Can machines think? Can they learn from their experience?
- If so, how?
- If not, why not?
- What does this say about human beings?
- What does this say about the mind?

Why AI?

Engineering: get machines to do useful things

e.g., understand spoken natural language, recognize individual people in visual scenes, find the best travel plan for your vacation, etc.

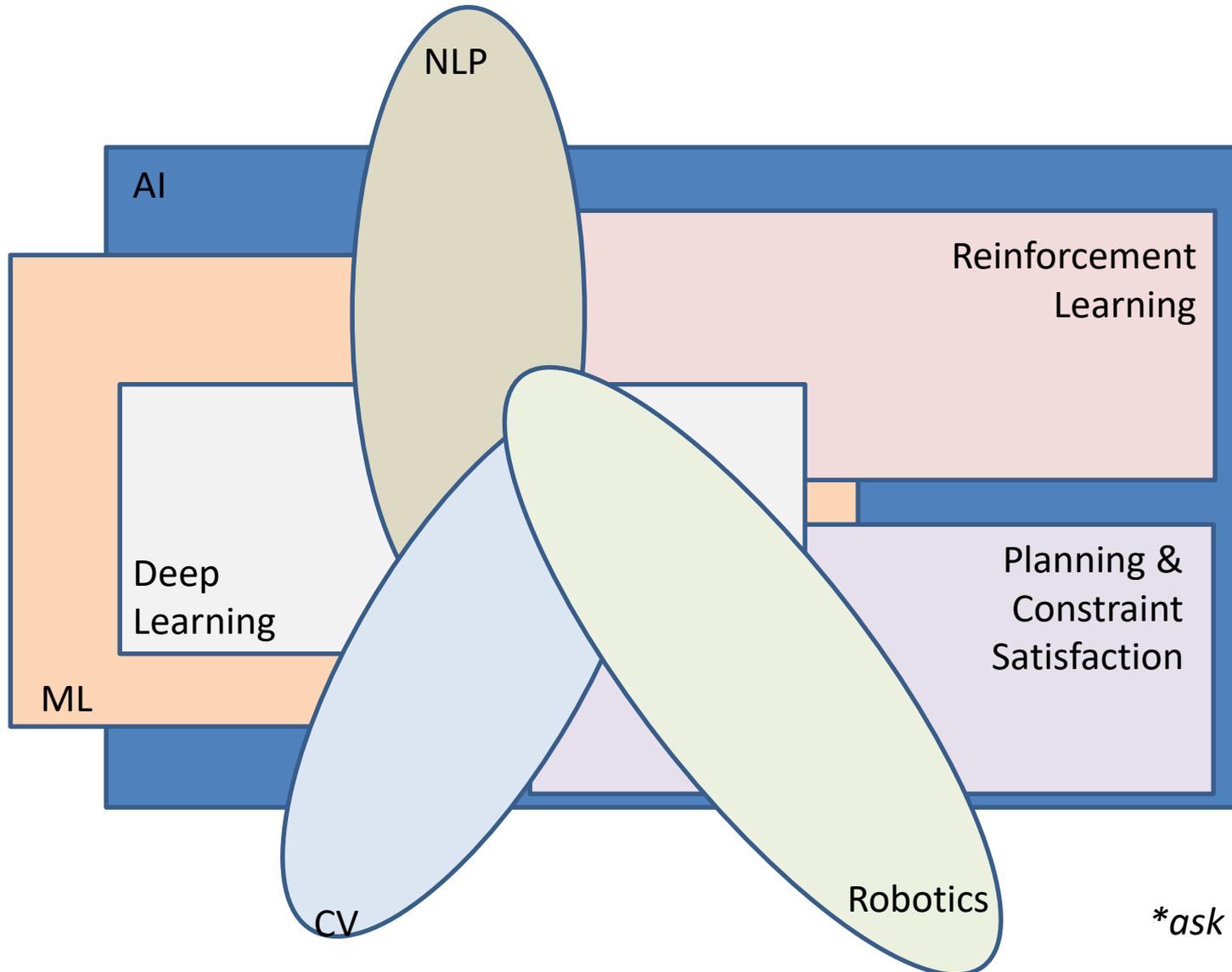
Cognitive Science: model and understand how natural minds and mental phenomena work

e.g., visual perception, memory, learning, language, decision making, etc.

Philosophy: explore basic, interesting and important philosophical questions

e.g., the mind body problem, what is consciousness, do we have free will, etc.

A Partial, Incomplete View of AI, as a diagram of keywords (my opinion*)



**ask 10 people, get
11+ opinions*

Potential Applications

Neural networks (again²): deep learning

Machine learning, datamining

Exploiting big data

Autonomous vehicles, robotics

Text mining, natural language technology, speech

Computer vision

...

Course Goals

Be introduced to some of the core problems and solutions of AI (big picture)

Learn different ways that success and progress can be measured in AI

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Practice your (written) communication skills